



## **Think Kidneys Position statement on the use of oliguria to detect AKI April 2016**

**This position statement is intended to inform how urine output measures can be used to detect AKI in clinical practice.**

*Acute Kidney Injury (AKI) is currently detected based on either an acute change in serum creatinine concentration or a reduction in urine output (oliguria). In contrast to elevations in serum creatinine concentration that may occur in both acute and chronic kidney disease, oliguria always indicates an acute process (outside of patients receiving dialysis for end-stage kidney disease). Current diagnostic criteria for AKI include thresholds of oliguria to define the presence and severity of AKI, but there remains some controversy as how such definitions of oliguria should be applied in clinical practice as a specific measure of renal injury.*

In 2014, an NHS patient safety alert required trusts in England to implement an automated laboratory algorithm to detect changes in serum creatinine concentration consistent with AKI (NHS/PSA/D/2014/010A, <https://www.england.nhs.uk/wp-content/uploads/2014/06/psa-aki.pdf>), but urine output criteria were deliberately not included. This position statement is intended to inform how urine output measures can be used to detect AKI in clinical practice.

### **Key points from existing evidence base**

As compared to AKI diagnosed using serum creatinine criteria, AKI defined using urine output criteria is an area that is less well studied; the majority of current data apply to critical care settings or patients who have undergone cardiac surgery. Prospective studies are few and generally smaller in sample size. Several studies have described poorer outcomes in ICU patients with oliguria, even in the absence of serum creatinine changes [1-3]. ICU patients with any stage of AKI defined by both creatinine and urine output criteria have worse outcomes as compared to AKI defined by either alone [1]. However, it is more difficult to ascertain whether adverse effects associated with reduced urine output are due to renal dysfunction, or whether confounding exists in that oliguria is identifying a cohort of more severely unwell patients. The associations with outcomes in post cardiac surgery situation are less clear. Using the AKIN criteria, McIlroy showed no association with AKI determined with urine output criteria whereas AKI based on serum creatinine changes was associated with mortality and subsequent need for RRT [4]. There are few data to guide the application of urine output criteria outside of these settings.

AKI diagnosed on urine output criteria typically occurs earlier in the time course of AKI as compared to a rise in serum creatinine concentration, and therefore may provide an earlier opportunity for AKI detection. This was seen in a critically ill cohort in whom approximately 50% of patients with AKI on urine output criteria proceeded to develop AKI based on serum creatinine criteria 24hrs later [5]. Similar findings were reported by Vaara et al, with 69% of oliguric patients subsequently developing creatinine-based AKI [3]. However, this also means that not all patients with oliguria develop changes in serum creatinine [6]; using urine output criteria therefore increases the number of patients classified as having AKI and in some cases identifies a different cohort of patients [2, 5]. This in turn translates to changes in the associations of AKI with patient outcomes (either magnitude of effect is reduced or strength of association weakened) [1, 4, 5].

Current AKI criteria describe oliguria in units of ml/kg/hour for defined time periods; this opens up a number of ways in which to apply in clinical practice. For example, urine output can be measured hourly; alternatively an average over a defined time period can be used. Pragmatically, both appear appropriate, with an hourly average over a six-hour period appearing to have similar associations with outcomes as hourly measurements [7, 8].

In contrast to the majority, one study in ICU patients did not see associations between outcomes using a 6hrly averaged urine output of 0.5ml/kg/hr, but did see associations with mortality and RRT when the definition was made more stringent (0.3ml/kg/hr) [8]. The authors concluded that the thresholds used in current AKI criteria might need to be more stringent. However, this would need further study before definite conclusions can be made, and for now it would seem appropriate to maintain consistency with the current criteria.

To measure urine output hourly, urinary catheterisation is required. Therefore, potential benefits must be balanced against the unintended consequences, in particular an increased risk of hospital acquired urinary tract infection that occurs at a rate of 3-8% per day of catheterisation [9, 10].

#### **Practical conclusions:**

1. Oliguria in a critically ill patient is an important clinical sign that should trigger urgent clinical review. In this setting, oliguria is relevant to the diagnosis of AKI as well as indicating that the patient is at risk of worse outcomes.
2. Urinary catheterisation to measure hourly urine output should not be a routine step in diagnosis of AKI outside of critical care settings; the risks and benefits of catheterisation should be based on individual patient assessment and discussed with the patient and/or their carers where appropriate.
3. Patients who describe convincing reductions in urine output should be evaluated clinically and by checking serum creatinine concentration to determine whether they have AKI. In hospitalised patients who are not catheterised, indications of oliguria (e.g. from fluid or hydration charts) can indicate patients at risk of developing AKI.
4. When evaluating a patient for oliguria, it is appropriate to use either hourly urine volumes, or to take an hourly average using total urine output over a six-hour period.
5. Patients with oliguria should be evaluated for urinary tract obstruction (including blockage of urinary catheter).
6. Patients with long-term urinary catheters should have hourly urine output measurements if they are admitted to hospital with acute illness and are at risk of AKI.
7. Urinary catheters inserted for measurement of urine output should be removed promptly when no longer necessary; the on-going need for catheterisation should be reviewed daily.
8. Further research is necessary regarding clinical use of urine output criteria to define AKI in general patient populations, and to determine the optimal thresholds to define oliguria.

## References:

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